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Syzygium jambos (L.) Alst. Rose apple

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Myrtaceae Myrtle family

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Syzygium jambos (L.) Alst., commonly known as rose apple, pomarrosa, or pomme rose (*13*), has spread throughout the moist tropics. Often planted as an ornamental, the species has become naturalized in many areas (fig. 1). Rose apple wood is used for firewood, charcoal, posts, and vegetable stakes.

HABITAT

Native Range

The native range of rose apple originally encompassed all or part of the Malay Archipelago and upper Burma (*28*). However, the species has become so widely cultivated and naturalized that the extent of its original habitat is uncertain (*5, 8*).

The tree has been cultivated for a long time (*5*), possibly from 500 B.C. in India (*18*). Rose apple, which has been introduced into all parts of the moist tropics (*4*), was brought to Jamaica in 1762 (*23*). It has become naturalized and is very common in the Caribbean Islands (*4, 12, 17, 24*), India (*28*), Sri Lanka (*26*), and Fiji (*22*).

Climate

Rose apple requires a moist habitat. It grows most frequently on stream banks (*27*), but becomes increasingly more common on upland sites as the mean annual precipitation rises above 1700 mm. Nearly all the rose apple habitat is encompassed by the subtropical moist and wet forests and the tropical moist forest types of the Holdridge life zones (*9*). An even distribution of rainfall is probably best, but a monsoonal climate is tolerated if there is adequate soil moisture during the dry season. Temperatures within the tropical environment do not appear to be critical. Successful ornamental plantings in southern California and Florida (*1, 12*) indicate a tolerance for light frosts.

Soils and Topography

Rose apple is not very exacting in its soil requirements along water courses (*12*). Most of the soils where it is successful are poorly or somewhat poorly drained. In upland areas, the species requires fertile soil; it grows very slowly on eroded or nutrient-depleted soils and generally cannot reproduce on dry sandy soils. In Puerto Rico, rose apple grows in soil where the pH is at least as low as 5.0. The upper limits of pH tolerance are not known. Where sufficient soil moisture is available, rose apple may grow near the coast (*7*), but it is more frequently encountered on foothills and lower mountain slopes. In continental areas, rose apple may grow at elevations up to 1,800 m (*15*).

Associated Forest Cover

Rose apple has not been studied in its native habitat, so those associations are not known. Along a watercourse in the moist foothills of Puerto Rico, where the elevation is

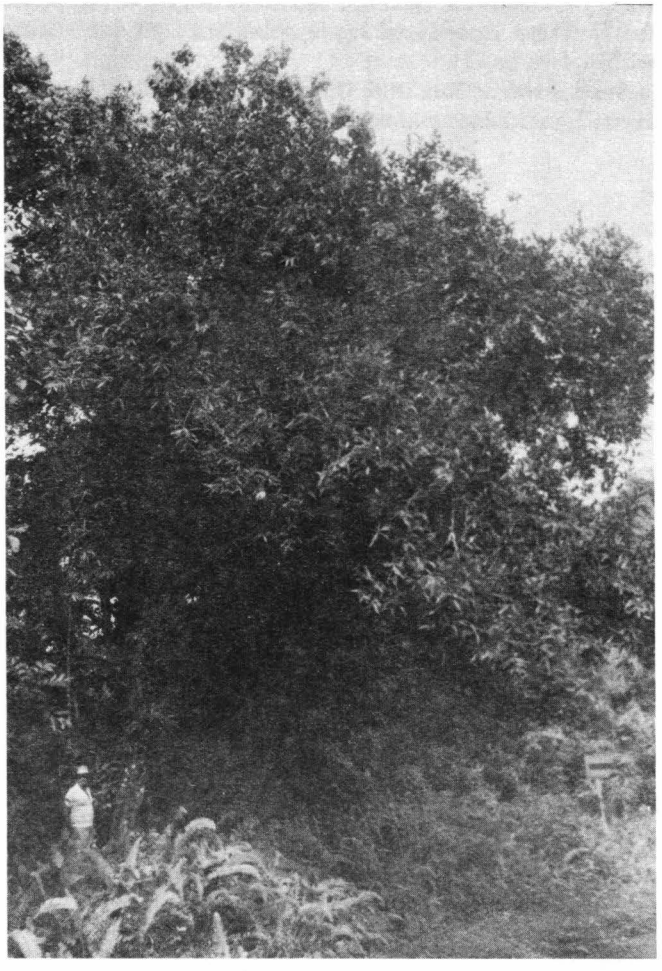

Figure 1.—*Naturalized rose apple tree* (Syzygium jambos) *growing in Puerto Rico.*

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55 m, it was found growing in secondary forests with *Pterocarpus officinalis* Jacq., *Inga vera* Willd., *Cecropia peltata* L., *Sloanea berteriana* Choisy, *Prestoea montana* (R.Graham) Nichols, and *Casearia arborea* (L.C. Rich.) Urban. On one upland woodlot in Puerto Rico, where the elevation is 25 m and the rainfall is 1650 mm, the following associates were noted: *C. arborea, C. guianensis* (Aubl.) Urban, *Didymopanax morototoni* (Aubl.) Decne. & Planch., *Guarea guidonia* (L.) Sleumer, *Phoebe elongata* (Vahl) Nees, *I. laurina* (Sw.) Willd., *Zanthoxylum martinicense* (Lam.) DC. (*32*).

LIFE HISTORY

Reproduction and Early Growth

Flowering and Fruiting.—The large white or yellow-white flowers are borne in terminal clusters of two to eight flowers (*5, 14,* fig. 2). In India, rose apple flowers between February and April (*28*); in the West Indies many trees flower throughout the year, although flowering is less frequent during the summer (*14*). The fruits ripen about 4 months after flowering (*28*). The fleshy drupes are pale yellow, sometimes tinged with pink, 2 to 5 cm in diameter, and shaped like a small apple or pear (*2, 5, 12*). Open-grown trees yield fruit abundantly, but understory trees bear few fruits. Trees reproduced by layering may produce fruits within 4 years (*2*).

Seed Production and Dissemination.—A brown nut about 1 cm in diameter containing one to four embryos lies within the central cavity of the fruit (*11, 14, 30*). There are from 385 to 440 seeds per kilogram (*29*). The seeds may be either moved some distance by birds and animals that feed on the fruit or carried by floodwaters, but most seeds simply fall under the parent trees (*11, 27, 29*).

Figure 2.—*Flowers, fruits, and leaves of rose apple* (Syzygium jambos).

Seedling Development.—The germination of seeds is hypogeous. Because most seeds contain more than one embryo, germination of fresh seeds always appears greater than 100 percent (*30*). Germination is best on the surface of moist soil or other growing media under shade (*28*). Seeds may take from 10 to 120 days to germinate (*30*). Fresh seeds have a 50-percent moisture content and cannot withstand drying. Viability of seeds stored unsealed at ambient temperatures is less than 1 month. However, an unsealed lot stored at 2 to 4 °C retained a 50-percent viability for 3 months (*30*).

Rose apple seedlings probably develop best under shade, but growth is slow. Seedlings sown in a Puerto Rican nursery took 250 days from sowing to reach a height of 24 cm.[1] Several planting methods have proven successful. Bare-root stock and freshly transplanted wildlings survived well on good sites but took 6 months to recover from transplant shock (*30*). Containerized stock would probably suffer less than transplanted stock. Direct seeding with no weed control resulted in 48- to 91-percent survival after 12 months (*30*). Competing weeds and brush do not appear to adversely affect survival. Direct seeding into a cleared site with full sun gave a much lower survival. Perhaps the best artificial regeneration strategy might be to seed into tilled seed-spots below a thin canopy of trees or brush that will be removed a few years later. Natural regeneration of rose apple stands on suitable sites is abundant and will proceed under almost any condition.

Vegetative Reproduction.—Rose apple trees coppice vigorously; numerous sprouts have been noticed on stumps as large as 60 cm (*30*). The species may also be reproduced by layering (*2*) and from stakes cut from seedlings and saplings (*15*). No hormone treatment is necessary.

Sapling and Pole Stage to Maturity

Growth and Yield.—Rose apple trees generally grow slowly. In the moist limestone hills of Puerto Rico, planted seedlings attained heights of 0.8 m in 2 years, 3 m in 7 years, and 4.5 m in 10 years. Rose apple is not a large tree. It attains a maximum height of about 15 m and a maximum diameter at breast height (d.b.h.) of about 40 cm (*15*). Whereas trees of seedling origin grow slowly, coppice growth is rapid (*30*). One year after clearcutting, rose apple trees produced dense stands of sprouts up to 3.6 m in height. Rapid growth continued until crowding caused a sharp reduction in growth rate. A 6-year-old coppice stand in Puerto Rico averaged about 3 cm in d.b.h., 7.5 m in height, 16,000 stems per hectare, and a basal area of 37 m^2/ha (*30*). This would yield approximately 139 m^3/ha of woody volume (estimated as the product of basal area and mean height, multi-

[1]Data on file at the Institute of Tropical Forestry, Southern Forest Experiment Station, USDA Forest Service, Río Piedras, Puerto Rico.

plied by 0.5), or 23 m^3/ha/yr. Another coppice stand, 12 to 15 years old, on the same site averaged about 5 cm in d.b.h., 9 m in height, 11,000 stems per hectare, and 32 m^2/ha, with a yield of approximately 144 m^3/ha, or 11 m^3/ha/yr. Periodic annual d.b.h. increment in another mixed and somewhat poorer stand (basal area = 15 m^2/ha), also of coppice origin, was 0.13 cm/yr over a 32-year period (*32*).

Rooting Habit.—Rose apple seedlings develop deep, strong taproots. As they become older, the lateral root system steadily becomes more important. Eventually a massive root system is produced (*30*). While useful for stabilizing soil on stream banks and steep slopes (*17*), the massive roots can make land clearing difficult. Aerial roots develop on trunks in humid areas, and natural layering (rooting) occurs when toppled or prostrate stems and branches come in contact with the soil.

Reaction to Competition.—Rose apple is shade tolerant. It is able to survive and grow into the midstory of mid- and late-secondary forests. On abandoned farmland, seedlings slowly grow up through dense weed, grass, and brush stands (*30*). Rose apple in turn casts a very dense shade so that its own seedlings die without release, and only a few very tolerant species can survive (*12*). The lack of ground cover under dense rose apple stands has resulted in sheet erosion in some areas (*30*). This can be alleviated by thinning to allow more light to enter.

Rose apple can become a weed problem in the establishment of plantations of other timber species (*31*). Most plantation species will have little difficulty overtopping rose apple seedlings, but stump sprouts from older rose apple trees that have been cut must be controlled until the crop trees reach 3 m or more in height. Large rose apple trees are probably most easily killed by cutting and poisoning the stump, followed by periodic sprout removal (*31*). Girdling can be effective, but it is slow. More than 1 year is required, and follow-up treatment at the end of the first year is necessary to remove the basal sprouts and cut the bark bridges that rapidly form across the girdle. Limited attempts in Puerto Rico to kill rose apple with sodium arsenite and the herbicide glyphosate applied to basal frills have not been very successful.

Damaging Agents.—A large number of insect species in Puerto Rico have been reported to feed on the leaves, twigs, flowers, and fruit of rose apple (*16*). An ant (*Myrmelachista ramulorum* Wheeler) that bores into the twigs and breeds has occasionally killed many of the terminal shoots of trees. No insects, however, are known to be a threat to the species. A fungus that often grows on the surface of the leaves gives trees a darker, sometimes gray look (*12*), but it is not known to cause significant damage. In Brazil, leaves of rose apple are attacked by a rust fungus, *Puccinia psidii* (*3*).

Rose apple wood is very susceptible to attacks by the dry-wood termite, *Cryptotermes brevis* (Walker) (*33*). Dead wood in the forest is consumed by the wet-wood termite, *Nasutitermes costalis* (Holmgren) (*16*). *Syzygium* spp. in Sri Lanka was fairly resistant to powderpost beetles (*Lyctus* spp.) both as green and seasoned wood (*29*). The *Syzygium* spp. complex in Fiji demonstrated moderate durability when challenged with three white-rot and two brown-rot fungi (*21*). Rose apple has the reputation of not being durable in the soil (*14*); however, it is claimed to be highly resistant to rot when submerged in water (*25*).

SPECIAL USES

The light-brown or grayish-cream wood of rose apple is hard and heavy, with a density of about 0.7 g/cm^3 (*14*). It is straight-grained, strong, and tough (*25*). Little is known about the drying and machining characteristics of this wood, perhaps because it is rarely sawn due to its small size and poor form. Rose apple is mainly used for roundwood products. In rural areas, rose apple is used for fenceposts, corral and building poles, tobacco drying sticks, and vegetable stakes (*30*). It splits easily, and splints are used for wattle (woven fences and partitions) and rough basketry (*17, 27*).

Rose apple wood makes excellent firewood and charcoal, its major uses today (*13*). Its bark contains 7 to 12 percent tannin (*10*) and could possibly be used in tannery.

Recommended for windbreaks and firewood in various agroforestry schemes in Costa Rica and Nicaragua (*20*), rose apple has been used in many areas for windbreaks and living fences (*15, 27*). Rose apple is planted in many regions as an ornamental (*1, 8*). The showy, cream-colored flowers, dark-green foliage, and moderate size contribute to its popularity. The original reason why rose apple spread throughout the tropics was because of its fruits, which have the distinct odor of roses and are dry and somewhat lacking in flavor. They have lost much of their popularity, but are still eaten locally and used in making jellies, preserves, and fruit salads (*10, 13*). Livestock, particularly pigs, consume the fruits when available (*12*). The roots, bark, and seeds are employed in several home remedies (*19, 24*). Rose apple is a good honey plant; bees produce a heavy, consistent flow of amber honey from its nectar (*6, 10*).

GENETICS

The genus *Syzygium* was at one time considered a part of the large genus *Eugenia*. Probably much revision remains for these two genera. Botanical synomyms are: *E. jambos* L., *Jambos jambos* (L.) Millsp., *Jambosa vulgaris* DC, and *Caryophyllus jambos* (L.) Stokes (*13, 14*).

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Caution: Pesticides can be injurious to humans, domestic animals, desirable plants, and fish or other wildlife—if they are not handled or applied properly. Use all pesticides selectively and carefully. Follow recommended practices for the disposal of surplus pesticides and pesticide containers.